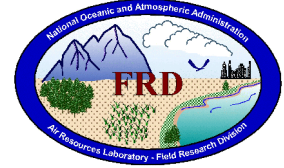




# FRD Activities Report December 2002



## Research Programs

### *CBLAST-Low*

In spite of the tragic death of co-principle investigator Dr. Timothy L. Crawford and the total loss of the LongEZ (registration N3R) research aircraft and all its instrumentation, efforts continue to support CBLAST-Low. Although essentially only one year of data was collected during the multi-year project (a three-week period from late July to early August 2001), it is our intention to go forward with the scientific analysis. We have an exceptionally high-quality data set and have numerous flights over the several CBLAST-Low surface assets including the ASIMET buoy, three-dimensional sea surface temperature array, and the R/V *Asterias*. These data are also being used for satellite (e.g., SAR) and model (e.g., COAMPS) verification and validation. However, earlier this year, a verbal agreement was struck with ONR to include N3R in a third intensive field study which will be conducted from late July to late August 2003. Obviously, N3R will not be participating in the 2003 CBLAST-Low field study.

Aircraft-based low-level turbulent flux measurements are absolutely critical to the success of CBLAST-Low. Various options have been explored in an attempt to replace N3R for the 2003 CBLAST-Low field study. We have recommended a joint effort with the San Diego State University (SDSU) to use their Sky Arrow airplane. Like N3R, the SkyArrow is a pusher airplane with the engine in the rear. The Sky Arrow also comes with a Standard Airworthiness Certificate allowing it to fly in the United States. Many of the instruments flown by N3R are routinely flown by the SDSU Sky Arrow. This includes the BAT probe, infrared gas analyzer (IRGA), and infrared radiometers. We should be able to add a laser altimeter for one-dimensional wave height characterization. In addition, we may be able to add a Ku-band scatterometer for short-wave characterization. The SDSU Sky Arrow will also be able to acquire some limited sea state characteristics such as sea surface temperature (SST), one-dimensional wave height/slope, and short wave mean square slope. (Jerry.Crescenti@noaa.gov)

### *SERA*

Efforts continue to rebuild the small environmental research aircraft (SERA) program after the tragic death of FRD Director Dr. Timothy L. Crawford and the total loss of the LongEZ (registration N3R) research aircraft and all its instrumentation. One of the recommendations from the ARL Airborne Research Requirements Workshop was to purchase a Velocity XL as a long-term solution to replace N3R as an ARL-based SERA. Detailed specifications have been provided to Velocity. In response, Velocity has provided a fairly detailed cost estimate for constructing and delivering a new aircraft custom-made to satisfy ARL research requirements.

The cost of this aircraft is roughly \$300K. Meanwhile, a detailed list of lost equipment and sensors has been constructed. The estimate for replacing this equipment is about \$142K. Detailed information can be found at a newly created web site for the ARL Aircraft Program at <http://arlaircraft.noaa.inel.gov>. (Jeff.French@noaa.gov, and Jerry Crescenti)

### ***URBAN-2000***

A final SF<sub>6</sub> concentration data set was released to the public this month. The data set includes concentrations corrected for CATS adsorption of SF<sub>6</sub>. The data set also includes sampler locations determined by Jerry Allwine using aerial photographs as well as the sampler locations we determined with GPS receivers. Progress also continues to be made on the final report. Only the results section remains to be fleshed out. We are investigating various methods of automatically plotting concentration isopleths from the sampling grids and sampling arcs for inclusion in the results section. (Kirk.Clawson@noaa.gov and staff)

### ***Joint URBAN-2003***

#### ATGAS Improvements

Several modifications have been made to the Automated Tracer Gas Analysis System (ATGAS) to speed up the analysis of samples and automate some of the QC checks. We are also working on improvements to make operation easier. Several of the improvements have been incorporated, but more testing needs to be conducted to ensure that they do not adversely affect the data quality. (Roger.Carter@noaa.gov, Debbie Lacroix)

#### ITT Continuous SF<sub>6</sub> Analyzers

Last fall, ITT offered to bring five TGA-4000 continuous SF<sub>6</sub> analyzers to the Joint URBAN-2003 project. Since they did not have experience operating the instruments, several members of the Science Committee suggested that FRD be allowed to operate the instruments for them. We had a number of discussions with them about what was involved in modifying and operating the instruments. However, the delivery date promised on the TGA-4000's was June 1, 2003, barely a month before the Joint URBAN-2003 project begins. We declined to operate the instruments because one month simply is not enough time to get them ready to go while we were making final preparations to go to the field. ITT has since decided to go ahead with the purchase and to attempt to modify and operate the units themselves, while expecting technical help from us at FRD. We are discussing arrangements for providing the help they have requested. (Roger.Carter@noaa.gov, Kirk Clawson)

#### New Samplers

Prototype printed circuit board layouts were completed for the sampler control and interface board, the micro-power switching power supply, and the cartridge memory module. The layouts were sent to a printed circuit board manufacturer and the prototype boards were received for testing in here in our lab. We have inserted components and started testing the new boards with

some modifications to the previous breadboard version this design is based on. The new board allows for a 13<sup>th</sup> valve to purge the samplers used with calibration standards. Also added to the current version is the ability to independently address the valves in the zero/spike cartridge and the valves inside the sampler. This will allow more flexibility in the operation of zero/spike samplers and allow purging. The final addition to the layout allows the use of a serial electrically erasable memory (EEPROM) module to store sampling data into each filled cartridge by the sampler during a test. Presently we have a few minor modifications required on the power supply board and main sampler board. The EEPROM module has not been tested yet.  
(Randy.Johnson@noaa.gov, Shane Beard)

### Rebuilding Old Cartridges

About 7400 lengths of tubing are cut out of the 7800 that will be needed to replace all of the tubes in the existing cartridges. Over 200 of the 650 cartridges now have the tubing installed. During December we received 2,300 of the 14,000 sampler cartridge bags. This puts sample bag construction ahead of our projected schedule. No bags have been installed in the rebuilt cartridges yet. (Randy.Johnson@noaa.gov, Shane Beard)

### Deployment Plans

Funding for FRD's participation in the summer field deployment continues to come in bits and pieces. Most recently we received \$150k to provide for new sampler construction and existing sampler cartridge overhaul. This increment will see us through to February. Deployment dates also changed slightly in consideration of the 4<sup>th</sup> of July holiday. IOP's are set to begin on the last weekend of June, with a stand-down on the 4<sup>th</sup> of July for safety purposes.  
(Kirk.Clawson@noaa.gov)

## **Cooperative Research with INEEL**

### ***INEEL Support***

Discussions continued with DOE management and contractors regarding proposed upgrades of the INEEL dispersion modeling. Finding a source of funding for the upgrades continues to be the main hurdle. With budgets being tight, there is no readily available source of funding within INEEL to support the effort. However, there is still hope that DOE will find the resources to at least begin the upgrade process. In the longer term, there is hope that the INEEL modeling effort can eventually be linked into an ARL dispersion modeling initiative, which is under consideration for the FY 2005 NOAA budget. (Richard.Eckman@noaa.gov and Kirk Clawson)

### ***INEEL Mesoscale Modeling***

Further tests were conducted with a new 2-grid MM5 configuration based on the 12 km Eta model output. This configuration takes advantage of the steadily increasing resolution of the

NCEP modeling products, and it runs faster than the current configuration, which is based on 40 km Eta model output. Snow cover continues to be a weak spot in the modeling. The Eta model still appears to provide unrealistic representations of snow cover, at least over Southeast Idaho. This often causes significant errors in the MM5 forecast temperatures. The NWS seems to have some fairly realistic maps of snow cover at <http://www.nohrsc.nws.gov>, but these data do not appear to be used for initializing the Eta model. (Richard.Eckman@noaa.gov)

## **Other Activities**

### ***Proposals***

The preproposal entitled “A Combined Observational and Modeling Study of Vertical Transport and Diffusion in the Complex Terrain of Southeast Idaho” passed through the initial screening process within the DOE VTMX program. FRD must now complete a full proposal by the end of January. The proposed study would use data from the INEEL Mesonet to look at vertical transport and mixing processes in stable conditions. Several sonic anemometers would be added to the existing tall Mesonet towers to enhance the turbulence measurement capability of the Mesonet. The data collection would proceed over at least a couple of years, which would allow the vertical transport and mixing studies to extend over seasonal and annual time scales. (Richard.Eckman@noaa.gov and Jerry Crescenti)

Discussions continued with Idaho State University on the possible installation of a meteorological network in the region around Yellowstone National Park. A proposal for the network is under development for submission to the NSF Major Instrumentation Program. Such a network would benefit ongoing university research activities at Yellowstone. In addition, support appears to be in place from the National Park Service, NOAA, and from the DOE at INEEL. (Richard.Eckman@noaa.gov; David L. McGinnis and Matt Germino, Idaho State University; Mark Williams, University of Colorado)

During a workshop held at ARL Headquarters in early December, an initiative was discussed to develop an ARL dispersion modeling system that could be used by all the divisions. This system would be based on the existing HYSPLIT model, and would eventually be integrated into the software available at the NWS field offices, so that local forecasters would have access to a modern dispersion forecasting system. The initiative has been placed into the FY 2005 NOAA budget process. If funded, this initiative would have some impact on the dispersion support to INEEL, since it would make sense to have the INEEL modeling integrated into the ARL-wide dispersion modeling effort. (Richard.Eckman@noaa.gov and Kirk Clawson)

### ***Aircraft Research Initiatives***

Three research initiatives were submitted to the teams coordinating the OAR FY’05 budget formulation process. The purpose of the initiatives is to obtain base funding for Federal salaries, aircraft time, and one-time funds for acquisition of equipment.

### Weather Research Flux Aircraft Initiative

This initiative is for \$1,600,000 to develop an airborne weather research program in support of the U. S. Weather Research Program (USWRP) heavy precipitation and flooding research focus. The funding will be used to develop an interdisciplinary NOAA-wide scientific team and develop an airborne capability to measure critical land-atmosphere-biosphere interactions including fluxes of sensible and latent heat and momentum, net solar and long-wave radiation, NDVI, and soil moisture, using microwave radiometry. It will also be used to create a transportable ground-validation soil moisture sensor array, develop techniques and algorithms that can be applied to similar measurements from satellites, provide the data necessary to develop research and operational models for better QPF, and establish a mechanism to incorporate research results into operational tools.

### Carbon Cycle Aircraft Initiative

This initiative is for \$1,600,000 to develop an airborne carbon cycle research program in support of the U. S. Global Climate Change Research Program (USGCRP) North American Carbon Program (NACP) and the Large-Scale CO<sub>2</sub> Observing Plan (LSCOP). The funds are for an aircraft program to make measurements of CO and CO<sub>2</sub> concentrations; of heat, momentum, and CO<sub>2</sub> fluxes; and of NDVI and soil moisture using remote sensing techniques. We will use this capability to participate in field programs to study the carbon cycle over terrestrial North America. These field programs will be coordinated through the U. S. Global Climate Change Research Program/Carbon Cycle Working Group and conducted in partnership with the NOAA Climate Monitoring and Diagnostics Laboratory (CMDL). The measurements we propose have four goals:

- to extend local-scale observations to regional-scale flux estimates;
- to relate vertical structures of CO<sub>2</sub> flux and concentration to boundary layer dynamics;
- to relate CO<sub>2</sub> fluxes to variations in soil moisture and vegetation; and
- to develop and validate measurement methods for satellite remote sensing products.

### Airborne Estuary Flux and Salinity Measurements Initiative

The initiative is for \$1,500,000 to make airborne measurements in critical coastal and Great Waters estuary habitats. The program will:

- use aircraft to measure the atmospheric concentration of nitrogen and speciated mercury compounds;
- use remote sensing to measure critical parameters of the water including surface color, salinity, and temperature; develop techniques and algorithms that can be applied to similar measurements from satellites;
- measure critical water-atmosphere-biosphere interactions including air surface exchange of mercury and nitrogen compounds;

- provide the data necessary to develop research and operational models for prediction of the effects on estuary health of mitigation strategies;
- and establish a mechanism to incorporate research results into operational tools.

The benefits of this initiative to NOAA include clarification of the physics of the mechanisms of atmospheric deposition to coastal waters, better characterization of the spatial and temporal distribution of these processes, improved understanding of the relationship between atmospheric and ecosystem health, development of more accurate models of the deposition of nutrients and toxic substances to coastal waters, and the development of remote sensing tools that can be used globally.

Full text of the initiatives as well as “White Papers” on the Weather Research and Carbon Cycle research initiatives are available at <http://arlaircraft.noaa.inel.gov> under the Programs button. (tom.watson@noaa.gov)

### ***Workshop on the US Climate Change Science Program Strategic Plan***

On December 3-5, Tom Watson (FRD), Richard Artz (ARLHQ), and Julian Wang (ARLHQ) attended the workshop on the US Climate Change Science Program Strategic Plan. The purpose of the workshop was to comment on the draft plan that will be used to determine the future of US climate research and to set Federal research funding priorities. The plan and workshop were held to respond to the President’s direction that the U.S. global change and climate change science programs must be objective, sensitive to uncertainties, and well documented for public debate. The U.S. global change and climate change research programs must consistently meet the highest standards of credibility, transparency, and responsiveness to the scientific community, as well as to all interested user groups, and our international partners. To assure the continued scientific credibility of the U.S. Climate Change Science Program, the workshop was held to provide a comprehensive review of the discussion draft of the Strategic Plan. The workshop discussions, supplemented by written comments submitted during a 30-day post-workshop period, will be reflected in the final Strategic Plan. We are currently working on written comments from ARL. (tom.watson@noaa.gov)

### ***Travel***

Kirk L. Clawson and Rick Eckman to Silver Spring, MD, December 9-11, for the ARL Modeling Workshop.

Tom Watson to Washington, D. C., December 2-9, to attend the U. S. Climate Change Science Workshop.

### ***Training***

Jerry Crescenti attended a two-day training course in Idaho Falls entitled *How to be a Highly Successful Team Leader* sponsored by Rockhurst University Continuing Education Center on December 16-17, 2002.

### ***Visitors***

The building we leased from Kingston Properties was sold to Ronald Frazell on November 15, 2002. Mr. Frazell met with Paula Fee on December 30 to look at the buildings and to go over the outstanding deficiencies that were not fixed by the previous owners. Copies of documentation to Kingston Properties regarding the numerous deficiencies were given to Mr. Frazell for his information. MASC Real Property is preparing the necessary paperwork to reflect the new ownership. Our lease expires in 2005, and it can be renewed. (paula.fee@noaa.gov)

### ***Awards***

A nomination package has been submitted by the LongEZ Research team (Jerry Crescenti, Ron Dobosy, Ed Dumas, and Jeff French) on behalf of Dr. Timothy L. Crawford for NOAA Research Employee of the Year Award (Posthumous). The purpose for submitting this nomination is to recognize Tim's many achievements through his long-term commitment to airborne flux research over a 15-year period from 1988 to 2002. (Jerry Crescenti.Crescenti@noaa.gov, and Jeff French)